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(54) **False ceiling structure including carrying sections and false ceiling slabs carried by them.**

(57) A false ceiling structure incudes parallel carrying sections curved in a vertical direction, which carry false ceiling slabs (3), the latter being self-supporting between adjacent sections (1). The slab (3) has a readily flexible outer layer (32) which is exposed. The slab further includes a mineral fibre layer (33) which is bonded to the outer layer (32). The layer (33) is formed of a plurality of parallel, tightly adjacent billets (331) of mineral fibre. The billets extend unbroken between the two slab edges (31) carried by the section flanges (2). The billets have a fibre orientation, which is in planes substantially at right angles to the plane of the outer layer (32) and to the longitudinal direction of said two slab edges (31), such that the slab (3) has a substantially lower bending stiffness in the longitudinal direction of the sections (1) then at right angles to said direction.

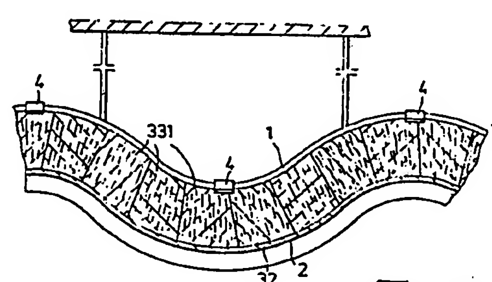

Fig. 2

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TITLE OF INVENTION

False ceiling structure including carrying sections and false ceiling slabs carried by them.

TECHNICAL FIELD

The invention relates to a false ceiling structure of the kind disclosed in the preamble of claim 1.

BACKGROUND ART

False ceilings of the kind discussed here are normally flat, i.e. they are formed from straight carrying sections lyig in a common plane with stiff, flat false ceiling slabs by the sections. For different, often aesthetic reasons, it is sometimes desired to give the false ceiling a curved shape. A wavy false ceiling can thus give advantages with relation to sound attenuation. In addition, lighting fittings can be placed in the top crest areas of a wave-shaped roof area, so that the fittings are not directly visible at a distance. Furthermore, for practical reasons it may be suitable to locally form the false ceiling with a downward curvature inside which piping can be placed or hidden. The slabs included in the false ceiling are preferably of a sound-deadening or sound-absorbing character and should also preferably afford fire protection.

Earlier methods of manufacturing curved sound-absorbing false ceilings are based on the technique of form-pressing the slabs to the desired curved shape. The geometry of the slabs will thus be determined by the appearance of the press tool, and the arcuate or wavy shape of the false ceiling can only be varied if a plurality of different curved ceiling slabs are available, which results in large costs in relation to manufacture, storage and the like.

The invention has the object of providing a false ceiling structure which can be readily given a singly-curved form of desired radii.

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CHARACTERIZATION OF THE INVENTION

Starting from the fals ceiling structure disclosed in the preamble of claim 1, the invention is distinguished by the features apparent from the characterizing portion of claim 1. The basis of the invention is that the singly arcuate form of the false ceiling is defined by portions curved in the vertical plane of the carrying sections and in that as false ceiling slabs there are utilised slabs which are self--supporting or self-supporting in their transverse direction i.e. in the direction normal to their opposing edge portions carried by the carrying sections, but which are easily deflectable in their longitudinal direction. The false ceiling slabs of the invention have a deflectable outer layer which is intended to be exposed, and a mineral fibre layer which is joined to the outer layer. The outer layer is preferably air--permeable and flameproof. The mineral fibre layer is formed in a manner per se from mineral fibre billets, which can be bonded to each other, e.g. glued to each other, alternatively they may be freely laid closely one against the other whereby the billets extend unbroken between the two slab edges which are to be carried by the carrying sections. The sublayers have a fibre orientation substantially in planes at right angles to the plane of the surface layer and to said slab edges. There is thus obtained for the mineral fibre layer a considerably higher stiffness to bending in its transverse direction than in its longitudinal direction. Accordingly, the slab can easily be given a singly curved shape in its longitudinal direction for joining up with the correspondingly curved portions of the carrying sections. A conventional mineral fibre mat is formed by the fibres being deposited on a flat gas-permeable substructure, whereafter the fibre mat formed is stabilised with the aid of a binder. In such a case the fibres will be substantially oriented in planes parallel to the plane of the substructure. Such a mineral fibre slab has substantially the same bending stiffnes in two directions at right angles in its plan , however.

It is known per se to cut billets from such mineral fibre mats and to stand them on edge and glue these billets into slabs or mats, which are optionally provided with an outer layer. Such products are used, e.g. for pipe insulation and heat insulating slabs with high requirements for their compressive strength. In accordance with the invention, such products are now used as false ceiling slabs in combination with carrying sections curved in a vertical direction. The slabs are built up so that in their transverse direction they are given high bending stiffness due to the fibres of the billets being arranged substantially in planes at right angles to the chief surfaces of the slab and to the longitudinal direction thereof. In this way, the resulting slab will have considerably lower bending stiffness in its longitudinal direction than in its transverse direction. The outer layer of the slab is suitably flexible or thin and deflectable, such as not to unnecessarily increase the stiffness of the false ceiling slab in its longitudinal direction. In this way the bending stiffness of the false ceiling slab can be adjusted to the width of the slab, i.e. the spacing of adjacent carrying sections, so that the slab is self-supporting substantially without sag between the carrying sections. Since the slab has substantilly lower bending stiffness in its longitudinal direction due to the mentioned billet structure, it can be readily formed to the curvature of the carrying section portions curved in the vertical plane. The false ceiling slabs can then often have a bending stiffness in their longitudinal direction which is so low that the slab connects up to the curveed carrying section portions by gravity. It should be clear, however, that the carrying sections usually include vertical webs or web portions and horizontal flanges, whereby, if so required, clamping means can be mounted on the upper part of the webs to press the slab down on to the flange of the section, so that the slab follows the flange curvature well. Such clamping means include a fork which can be pushed over the upper portion of the vertical web of the car-

rying s ction, and a flange which thrusts out horizontally for bringing into engagement against the upper edge portion of the slab. These clamping means can come into use when a portion of the false ceiling is to be given a relatively heavy curvature. It should be clear, however, that the slab can be given an edge groove in which the flange of the carrying section engages, the curvature of the slab thus being defined by the flange of the section, and no clamping means is required to cause the longitudial curvature of the slab to mate with that of the section.

The invention is defined in the appended claims.

The invention will now be described in the form of an example and with reference to the accompanying drawing.

DRAWING

Fig. 1 schematically illustrates a cross section through a false ceiling structure in accordance with the invention.

Fig. 2 is a section along the line II-II in Fig. 1.

Fig. 3 is a perspective view of a slab included in a structure in accordance with Figs. 1 and 2.

Fig. 4 schematically illustrates a detail of a cross section through an alternative structure in accordance with the invention.

EMBODIMENTS

In Fig. 3 there is illustrated a rectangular false ceiling slab which has two opposing long edges 31, along which the slab 3 is intended to be carried on carrying sections which are suspended from a false ceiling structure, as will be described later. The slab 3 accordingly has a longitudinal direction L, which is parallel to the direction of the edges 31, and a width direction B at right angles thereto. The slab 3 includes an outer layer 32 preferably of air-permeable and flameproof material, which can be a glass fibre fabric and can be painted or the like. In addition, the slab 3 includes

a mineral fibr layer 33 glued to the outer layer 32. The layer 32 comprises a plurality of parallel min ral fibre billets 331 tightly adjacent each other. Each of the billets 331 is formed from a mineral fibre mat produced conventionally, the billets 331 of the layer 3 being arranged so that their chief fibre plane is at right angles to the outer layer 32 and at right angles to the longitudinal direction L of the slab 3. The surfaces of the mutually adjacent billets can be bonded to each other, e.g. glued to each other, or alternatively they may be freely placed tightly against each other.

Turning now to Figs. 1 and 2, it will be seen that the slab 3 is carried by sections 1, conventional per se, and having at horizontal flanges 2, forming seatings for edge portions 31 of the slab 3, at least on their mutually opposing sides. The billets 331 thus extend unbroken between two adjacent sections 1, and have great bending stiffness in this direction due to the indicated fibre orientation in the billets, so that the slab is self-supporting without substantial sag between two adjacent sections 1. In the longitudinal direction L of the slab 3 it has a notably lower bending stiffness than in the width direction B, and for this reason the slab will be deformed by gravity to form a curve mating substantially with the shape of the sections 1 in as vertical direction.

As indicated in Figs. 1 and 2, the sections 1 can have a curved form in the vertical plane in a longitudinal portion, the curved portions being in register with each other. In this way the slab 3 can assume the form defined by the curved section portions.

As indicated in Figs. 1 and 2, the sections 1 may have horizontal flanges on which the slab 3 rests. If the vertical curvature of the sections 1 should be so great that the slab 3 does not come entirely into engagement against the flanges 2 by gravity, so-called clips 4 can be utilised to cause the slab 3 more closely to follow the flanges 2. The sections 1 may conventionally include vertical webs 21 and the clips 4

can have a fork which can be pushed over the upp r part of the webs 21, and a flange extending in ver th dge region of the slab 3. By pressing down the clip 4 onto the web 21, the edge portion of the slab can be pressed into intimate contact with the flange 2 on the section 1.

Conventional suspension means for the carrying sections 1 are schematically indicated in Figs. 1 and 2, but these means are no part of the present invention. In Figs. 2 and 3 the main fibre orientation is indicated by dashed lines in the different billets 331, and it should be clear that the longitudinal direction L of the slab 3 is the normal direction to the main plane of orientation of the fibres.

An alternative embodiment of a slab included in the false ceiling structure in accordance with the invention is illustrated in Fig. 4, the slab 3 having an edge groove 35 receiving the horizontal flange 2 of the section 1. In this case the grooved side edge of the slab 3 should be clad with an elastic material reinforcing the edge and allowing the slab to assume said singly curved form.

The slab 3 can be given desired curvature in its longitudinal direction without its bending stiffness in the width direction B being changed to any essential degree. Singly curved, arcuate or wavy false ceilings with different radii of curvature can therefore be produced with a single type of slab 3. In this way the radii of curvature, rise, wave frequency and the like for a false ceiling which is not flat can thus be selected fairly freely. The singly curved appearance of the false ceiling is determined by suitable desired selection of the curvature of the carrying sections, the slabs being able to assume this curvature in the way described above. By means of the invention it is thus possible to produce different false ceilings with desired different single curvature with the aid of a single type of slab, which is flexible in its longitudinal direction, in contradistinction to the previous technique where the single curvature of the false ceiling was defined by slabs fixed as to their shape.

With the aid of the invention, the fals ceiling can thus be given a singly curved appearance, e.g. merely in given longitudinal portions of the ceiling, the curvature being selected substantially freely. This further means that the slabs 3 can be used for flat ceiling sections also. The curvature of the ceiling and the slabs 3 is thus determined by the vertical curvature of the carrying sections.

The essential difference between the invention and the previous technique within the field may be considered as lying in the use of the slabs defined above as false ceiling slabs in the given configuration, in combination with carrying sections with portions curved in the vertical plane for the false ceiling slabs.

CLAIMS

1. False ceiling structure including parallel carrying sections (1) having horizontal flanges (2) at their mutually facing sides, and a false ceiling slab (3) placed between two adjacent sections, and self-supporting between these sections with its opposing edges (31) being carried by the flanges (2), the slab including an exposed downwardly facing outer layer (32) with a mineral fibre layer (33) joined thereto, ***characterized*** in that at least one portion of the sections (1) has an extension curved in the vertical plane, in that the outer layer (32) of the slab is flexible, in that the mineral fibre layer (33) of the slab is formed from a plurality of parallel, tightly adjacent, mineral fibre billets (331), the billets (331) extending unbroken between the two said slab edges (31) carried by the section flanges (2), said billets having a fibre orientation substantially in planes at right angles to the plane of the outer layer (32) and to the direction (L) of said two slab edges (31).

2. False ceiling structure as claimed in claim 1, ***characterized*** in that the sections have vertical webs and that clips are thrust over the upper parts of the webs (21) to keep, with the aid of a flange, the said edge portions of the slab (3) in contact with the horizontal flanges (2) of the carrying sections.

3. False ceiling structure as claimed in claim 1, ***characterized*** in that the side surfaces of the slab at the edges (31) have grooves (35) in which the horizontal flanges of the sections (1) engage.

4. False ceiling structure as claimed in claim 3, ***characterized*** in that the side surfaces of the slab (3) are clad with an elastic layer (34).

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Fig.1

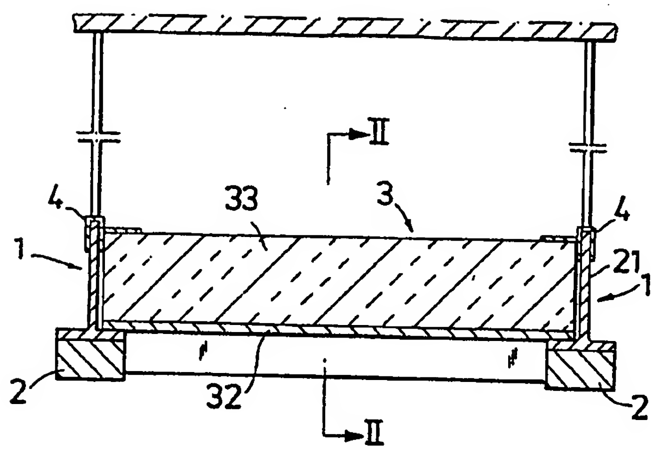

Fig.2

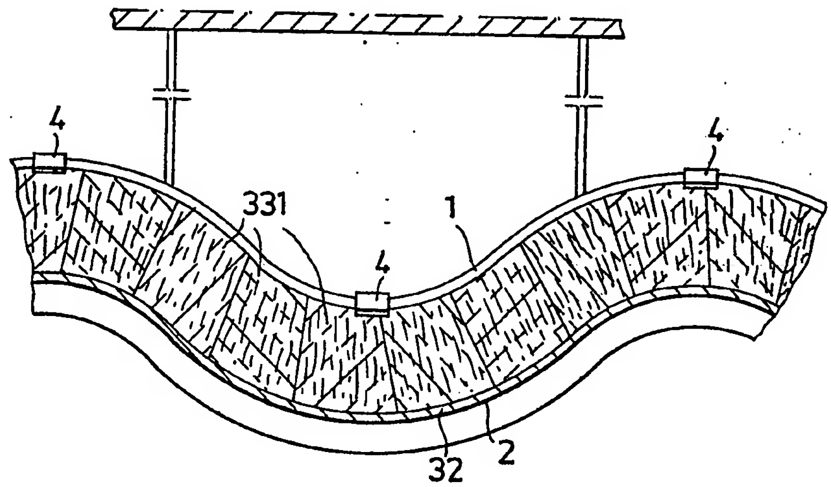

Fig.3

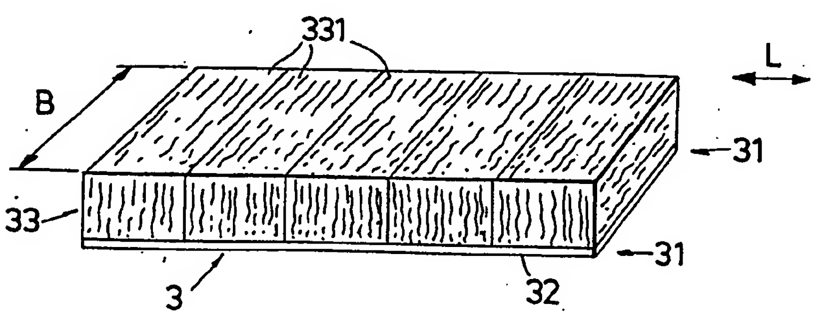

Fig. 4